REMARKS

1. This paper is responsive to the Office Action mailed May 7, 2004. Reconsideration and further examination is respectfully requested.

2. In brief, the present invention is a method of gathering three dimensional data using a digital image capture system.

3. Claims 1-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Morris et al. in view of Mengel et al.

4. Regarding claims 1 and 11, the Examiner claimed that, "Morris et al. disclose, ... an image capture device and method of operating thereof comprising: a plurality of pixel sensors ...; a plurality of timers ... individually coupled with at least some of said pixel sensors ...; a plurality of intensity comparitors (inherently included ...) coupled with said timers ... and said at least some of said pixel sensors..." The Examiner also claimed that, "Morris et al. disclose as stated in column 4 (lines 9 -52), that in a premetering mode, the timers are started in synchronization with the initialization of the plurality of pixels sensors and are independently stopped based on an increase in brightness determined reflected by the scene. In other words, the plurality of timers (130) individually coupled ... with at lease some of the plurality of pixel sensors ... are stopped when the brightness intensity of a certain number of pixel sensors (118) within the plurality of pixel sensors ... exceeds a certain level." However, please notice that Morris et al. explicitly state (column 4, lines 19 – 23) that, "the time measurement circuit

(130) counts a number of the pixel sensing units (118) that have reached the intensity threshold and generates an energy time stamp to mark a time when the number exceeds a predefined number threshold. For example, if one of the number thresholds represents 1000 pixels, then the time measurement circuit (130) generates an energy time stamp to mark the time when 1000 of the pixel sensing units (118) indicate that the intensity threshold has been reached." This is a completely different method from that of applicant's invention where a **plurality of timers** (note that Morris et al. use a single "time measurement circuit (130)" for each group of pixels) are **independently stopped based on an increase in brightness** producing **delay data** from **each of the plurality of timers** thus generating an array of **delay data** representing the time required for a flash to reach the imaged object and reflect back to the corresponding pixels of the digital image. Claims 1 and 11 have been amended to clarify that the **plurality of timers individually coupled with <u>each</u> of said pixel sensors,** create a **quantity of delay data corresponding to the time required for the light from said flash to illuminate an object, then return to the image capture device.** Thus, throughout applicant's invention a timer coupled with a pixel sensor is used to measure the amount of time required for light from the flash to reach the imaged object then return to that pixel sensor. This structure is replicated throughout the image capture device, thus creating a two-dimensional array of delay data corresponding to the distance from the camera to the image object for each pixel sensor in the array coupled with a timer. Thus applicant has differentiated claims 1, and 11 from the prior art and believes these claims to be in condition for allowance.

5. Regarding claims 2 and 12, the Examiner stated that, "Claims 2 and 12 are broad in the fact the requirements of the claim do not link the delay data to the timers of claims 1/11, respectively, nor do the requirements of the claim define what delay data is." The Examiner is correct that the delay data was poorly defined in the claims. Claims 1, 6, and 11 have been amended to clarify that the delay data is produced by the plurality of timers and corresponds **to the time required for the light from said flash to illuminate an object, then return to the image capture device**. Thus claims 2 and 12 (since they are dependent on claims 1 and 11 respectively) now include the limitations of claims 1 and 11 that the delay data is produced by the plurality of timers and corresponds **to the time required for the light from said flash to illuminate an object, then return to the image capture device.** With these clarifications, applicant now believes claims 2 and 12 to be in condition for allowance.

6. Regarding claims 3 and 13, the Examiner stated that, "Morris et al. disclose, as stated in column 8 (lines 1 – 10), ... a converter ... coupled with said first memory ... and a third memory ... wherein said converter (262) receives said delay data from said first memory (120) and stores distance data in said third memory" however, in the referenced lines of the patent of Morris et al. applicant can find no reference whatsoever to converting *delay data* to *distance data*. Morris et al. do not even mention the generation of *distance data*. In fact Morris et al. (in the relevant portions of their patent) state that, "once the durations are determined, the microprocessor (262) may interact with the imager (140) to transmit indications of the *durations* to the imager (140)." [emphasis added] Notice that Morris is transmitting *indications of the durations* to the imager, not **distance data.** Thus, this element of applicant's invention is not present in

Morris, and claims 3 and 13 have been distinguished from the prior art and are in condition for allowance.

The Examiner also notes the confusion with applicant's use of the term **distance data** stating, "Claims 3 and 13 are also broad in the fact the requirements of the claim do not link the distance data to the timers of Claims 1/11, respectively, or the delay data of claims 2 and 12, respectively, nor do the requirements of the claim define what distance data is." Claims 3, 8, 13, and 17 have been amended to clarify that the **distance data** is converted from the **timing data**, and corresponds **to the distance from the image capture device to an imaged object**. Thus, applicant believes claims 3 and 17 to have been distinguished from the prior art and to now be in condition for allowance.

7. Regarding Claims 4 and 14, these two claims are dependent upon claims 1 and 11 respectively, and thus include all of the limitations of claims 1 and 11. As discussed above, claims 1 and 11 have been distinguished from the prior art and are in condition for allowance, and thus dependent claims 4 and 14 have also been distinguished from the prior art and are also now in condition for allowance.

8. Regarding Claim 5, this claim is dependent upon claim 1, and thus includes all of the limitations of claim 1. As discussed above, claim 1 has been distinguished from the prior art and is in condition for allowance, and thus dependent claim 5 has also been distinguished from the prior art and is also now in condition for allowance.

9. Regarding claim 6, the Examiner claimed that, "Morris et al. disclose, ... an image capture device comprising: a plurality of pixel sensors ...; a plurality of timers ... individually coupled with at least some of said pixel sensors ...; a plurality of intensity comparitors (inherently included ...) coupled with said timers ... and said at least some of said pixel sensors..." The Examiner also claimed that, "Morris et al. disclose as stated in column 4 (lines 9 -52), that in a premetering mode, the timers are started in synchronization with the initialization of the plurality of pixels sensors and are independently stopped based on an increase in brightness determined reflected by the scene. In other words, the plurality of timers (130) individually coupled ... with at lease some of the plurality of pixel sensors ... are stopped when the brightness intensity of a certain number of pixel sensors (118) within the plurality of pixel sensors ... exceeds a certain level." However, please notice that Morris et al. explicitly state (column 4, lines 19 – 23) that, "the time measurement circuit (130) counts a number of the pixel sensing units (118) that have reached the intensity threshold and generates an energy time stamp to mark a time when the number exceeds a predefined number threshold. For example, if one of the number thresholds represents 1000 pixels, then the time measurement circuit (130) generates an energy time stamp to mark the time when 1000 of the pixel sensing units (118) indicate that the intensity threshold has been reached." This is a completely different method from that of applicant's invention where a **plurality of timers** (note that Morris et al. use a single "time measurement circuit (130)" for each group of pixels) are **independently stopped based on an increase in brightness** producing **delay data** from **each of the plurality of timers** thus generating an array of **delay data** representing the time required for a flash to reach the imaged object and reflect

back to the corresponding pixels of the digital image. Claim 6 has been amended to clarify that the **plurality of timers individually coupled with <u>each</u> of said pixel sensors,** create **a quantity of delay data corresponding to the time required for the light from said flash to illuminate an object, then return to the image capture device.** Thus, throughout applicant's invention a timer coupled with a pixel sensor is used to measure the amount of time required for light from the flash to reach the imaged object then return to that pixel sensor. This structure is replicated throughout the image capture device, thus creating a two-dimensional array of delay data corresponding to the distance from the camera to the image object for each pixel sensor in the array coupled with a timer. Thus applicant has differentiated claim 6 from the prior art and believes this claim to be in condition for allowance.

10. Regarding claim 7, the Examiner stated that, "Claim 7 is broad in the fact the requirements of the claim do not link the delay data to the timers of Claim 6, nor do the requirements of the claim define what delay data is." The Examiner is correct that the delay data was poorly defined in the claims. Claim 6 has been amended to clarify that the delay data is produced by the plurality of timers and corresponds **to the time required for the light from said flash to illuminate an object, then return to the image capture device.** Thus claim 7 (since it is dependent on claim 6) now includes the limitations of claim 6, that the delay data is produced by the plurality of timers and corresponds **to the time required for the light from said flash to illuminate an object, then return to the image capture device.** With these clarifications, applicant now believes claim 7 to be in condition for allowance.

11. Regarding claim 8, the Examiner stated that, "Morris et al. disclose, as stated in column 8 (lines 1 – 10), ... a converter ... coupled with said first memory ... and a third memory ... wherein said converter (262) receives said delay data from said first memory (120) and stores distance data in said third memory" however, in the referenced lines of the patent of Morris et al. applicant can find no reference whatsoever to converting *delay data* to *distance data*. Morris et al. do not even mention the generation of *distance data*. In fact Morris et al. (in the relevant portions of their patent) state that, "once the durations are determined, the microprocessor (262) may interact with the imager (140) to transmit indications of the *durations* to the imager (140)." [emphasis added] Notice that Morris is transmitting *indications of the durations* to the imager, not **distance data**. Thus, this element of applicant's invention is not present in Morris, and claim 8 has been distinguished from the prior art and is in condition for allowance.

The Examiner also notes the confusion with applicant's use of the term **distance data** stating, "Claim 8 is also broad in the fact the requirements of the claim do not link the distance data to the timers of Claim 6, or the delay data of claim 7 nor do the requirements of the claim define what distance data is." Claims 3, 8, 13, and 17 have been amended to clarify that the **distance data** is converted from the **timing data**, and corresponds **to the distance from the image capture device to an imaged object**. Thus, applicant believes claim 8 to have been distinguished from the prior art and to now be in condition for allowance.

12. Regarding Claim 9, this claim is dependent upon claim 6, and thus include all of the limitations of claim 6. As discussed above, claim 6 has been distinguished

from the prior art and are in condition for allowance, and thus dependent claim 9 has also been distinguished from the prior art and is also now in condition for allowance.

13. Regarding Claim 10, this claim is dependent upon claim 6, and thus includes all of the limitations of claim 6. As discussed above, claim 6 has been distinguished from the prior art and is in condition for allowance, and thus dependent claim 10 has also been distinguished from the prior art and is also now in condition for allowance.

14. Regarding claim 15, the Examiner claimed that, "Morris et al. disclose, ... an image capture device and method of operating thereof comprising: means for capturing light intensity values of pixels ...; means for comparing light intensity values of pixels ... means for timing ... how long it takes light reflected from an object to reach said means for capturing light intensity values of pixels ..." The Examiner also claimed that, "Morris et al. disclose as stated in column 4 (lines 9 - 52), that in a premetering mode, the means for timing is started in synchronization with the initialization of the means for capturing light and is independently stopped based on an increase in brightness determined reflected by the scene. In other words, the means for timing (130) is individually coupled ... with the means for capturing (individually coupled respectively with the means for capturing ...) are stopped when the brightness intensity of a certain number of pixel sensors (118) of the means for capturing ... exceeds a certain level (intensity threshold)." However, please notice that Morris et al. explicitly state (column 4, lines 19 – 23) that, "the time measurement circuit (130) counts a number of the pixel sensing units (118) that have reached the intensity threshold and generates an energy time

stamp to mark a time when the number exceeds a predefined number threshold. For example, if one of the number thresholds represents 1000 pixels, then the time measurement circuit (130) generates an energy time stamp to mark the time when 1000 of the pixel sensing units (118) indicate that the intensity threshold has been reached." This is a completely different method from that of applicant's invention where a **means for timing on a per pixel basis** (note that Morris et al. use a single "time measurement circuit (130)" for each group of pixels) **how long it takes light from flash to reflect from said object to said means for capturing light intensity values as determined by said means for comparing light intensity values of pixels**. Claim 15 has been amended to clarify that the **means for timing** operate **on a per pixel basis**, measuring **how long it takes light from flash to reflect from said object to said means for capturing light intensity values as determined by said means for comparing light intensity values of pixels**. Thus, throughout applicant's invention a means for timing is coupled with a pixel sensor **on a per pixel basis** and is used to measure **how long it takes light from flash to reflect from said object to said means for capturing light intensity values as determined by said means for comparing light intensity values of pixels**. This structure is replicated throughout the image capture device, thus creating a two-dimensional array of delay data corresponding to the distance from the camera to the image object for each pixel sensor in the array coupled with a timer. Claim 15 has also been amended to include the limitation of **means for producing a quantity of delay data from said timers, corresponding to the time required for the light from said flash to illuminate an object, then return to the image capture device**, thus clarifying how the calculation of delay data is performed. This element is not present in the prior art as cited by the Examiner,

thus applicant has differentiated claim 15 from the prior art and believes this claim to be in condition for allowance.

15. Regarding Claim 16, this claim is dependent upon claim 11, and thus includes all of the limitations of claim 11. As discussed above, claim 11 has been distinguished from the prior art and is in condition for allowance, and thus dependent claim 16 has also been distinguished from the prior art and is also now in condition for allowance.

16. Claim 17 has been cancelled and it's limitation incorporated into independent claim 15.

17. Regarding Claim 18, this claim is dependent upon claim 15, and thus includes all of the limitations of claim 15. As discussed above, claim 15 has been distinguished from the prior art and is in condition for allowance, and thus dependent claim 18 has also been distinguished from the prior art and is also now in condition for allowance. Claim 18 has been amended to change its dependency from claim 17 to claim 15.

18. Regarding Claim 19, this claim is dependent upon claim 15, and thus includes all of the limitations of claim 15. As discussed above, claim 15 has been distinguished from the prior art and is in condition for allowance, and thus dependent claim 19 has also been distinguished from the prior art and is also now in condition for allowance.

19. For these reasons, this application is considered to be in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

by _____

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